THE

YOUNG MECHANIC.

OCTOBER, 1833.

CHEMISTRY.

WATER.

MALVERN WATERS. From the Malvern hills, Worcestershire, various springs issue, of different qualities. One, in particular, has been a long time in repute for its medicinal efficacy, and has obtained the name of *Holy-well*. According to Dr. Wilson one gallon of this water contains

Carbonate of Soda,	5·33 grains,
" of Lime,	1·6,
" of Magnesia,	919,
" of Iron,	625,
Sulphate of Soda,	2·896,
Hydrochlorate of Soda,	1·553,
Silex,	1·687.

The water of St. Ann's well, from the same hills, according to Dr. Wilson, contains in one gallon,

Carbonate of Soda,	3·55 grains,
" of Lime,	352,
" of Magnesia,	26,
" of Iron,	328,
Sulphate of Soda,	1·48,
Hydrochlorate of Soda,	955,
Silex,	47.

MOFFAT WATERS. About a mile and a half from Moffat, Scotland, is situated the celebrated Moffat well. It has been held in high estimation, for nearly two centuries. According to Garnet its composition is as follows:

Water,	103643,
Carbonic Acid,	1 cub. in.,
Sulphuretted hydrogen,	10,
Nitrogen,	4,
Hydrochlorate of Soda,	3·6 gr.

PITCAITHLY WATERS. The town of Pitcaithly, in Scotland, has long been celebrated for its waters. There are in the place five distinct springs, all partaking of the same qualities. According to Dr. Murray, a pint of the water contains,

Air,	0·5 cub in.
Carbonic Acid,	1,
Hydrochlorate of Soda,	13·4,
" of Lime,	19·5,
Sulphate of Lime,	9,
Carbonate of Lime,	5

PYRMONT WATER. This water belongs to the class called acidulous chalybeate. It contains a large proportion of carbonic acid, and is said to sparkle like the briskest Champaigne wine when taken from the fountain, and when drank fresh to produce a degree of intoxication. It is situated in Pyrmont in Germany.

One hundred pounds of this water contain,

Carbonic Acid,	1500 gr.
Carbonate of Lime,	343·75,
" of Magnesia,	339,
" of Iron,	105·5,
Hydrochlorate of Soda,	122·0,
" of Magnesia,	134,
Sulphate of Soda, (cryst.)	289,
" of Magnesia, (cryst.)	547,
Resinous Principles,	9.

SARATOGA WATERS. The Saratoga and Ballston springs, are yearly becoming more celebrated, both for their medicinal properties, and a place of fashionable resort. They are situated in the county of Saratoga, in the state of New York, and are about 7 miles distant from each other. Water from Congress spring contains,

Hydrochlorate of Soda,	297·3,
Hydrodate of Soda,	3,
Carbonate of Soda,	19·21,
" of Lime,	92·4,
" of Magnesia,	23·1,
Oxide of Iron,	5·39.

It contains also a small portion of silica, alumina, and Bromine.

SELTZER WATER. This water proceeds from a spring in Lower Seltzer, about ten miles from Francfort in Germany. It is remarkably clear, possesses a smart pungent taste and discharges an abundance of air bubbles when poured from one bottle into another. It is esteemed useful in many diseases, and is much used by visitors at the spring, and the inhabitants of other places, large quantities being yearly put up for transportation. Its composition according to Bergman, is,

Water,	8949,
Oxygen,	435 cub. in.
Carbonic Acid,	13·068,
Carbonate of Soda,	5·22 gr.
" of Lime,	78·3
" of Magnesia,	5·32,
Hydrochlorate of Soda,	13·74.

SPA WATERS. The spa, derives its name from the town of Spa, in France. This place is resorted to by persons from all parts of Europe, for the benefit of the water, the value of which, may be inferred from the circumstance that the town has on its account been allowed a neutrality during the hottest wars. One hundred quarts of this water contains,

Carbonic Acid,	1030 cub. in.
Carbonate of Lime,	154·5 gr.
" of Magnesia,	365·5,
" of Soda,	154·5,
" of Iron,	55·2,
Hydrochlorate of Soda,	18·2.

SEA WATER. It has been before remarked that water is one of the most abundant and extensively diffused compounds on our globe. The water of the ocean forms the principal part ; it is the great reservoir from which the water proceeds, which in the form of rain and dew fertilizes the earth. Raised by the heat of the sun into the atmosphere, and condensed upon the earth into streams, that give rise to springs and rivers, it again returns to its source. The absolute quantity of the water of the ocean cannot be ascertained, as its mean depth is unknown. On the supposition that its mean depth is not greater than one fourth part of a mile, its solid contents would not be less than 32,000,000 cubic miles. At a distance from shore it is clear, colorless, and without odor, it possesses a strong saline, and also, more particularly at its surface a nauseous and bitter taste. Its specific gravity varies in different latitudes and circumstances, from 1·0269 to 1·10285. It freezes at 28½° F. Dr. Marcet in a paper published in the Phil. Trans. for 1829, has shown that in Baffins Bay, the Mediteranean Sea, and the Tropical Seas, the temperature of the water diminishes with the depth, but in the Arctic or Greenland Seas, the temperature increases with the depth. We are indebted to Mr. Scoresby who first observed this singular circumstance, the truth of which has been more lately confirmed by the experiments of Franklin, Beechy and Fisher. It is composed of lime, magnesia, soda, sulphuric acid, hydrochloric acid, hydriodic acid, potash and ammonia, and bromine. From Dr. Murray's analysis of water collected in the Frith of Forth, we learn that a pint contains 226·1 grains of saline matter, viz. of,

Lime,	2·9 grains,
Magnesia,	14·8,
Soda,	96·3,
Sulphuric Acid,	14·4,
Hydrochloric Acid,	97·7,
	226·1.

If we evaporate sea water, we obtain hydrochlorate of soda, and magnesia, and sulphates of magnesia and lime. Supposing therefore that the elements are thus united, its composition would be,

Hydrochlorate of Soda,	180·5 grains,
" of Magnesia,	23·0,
Sulphate of Magnesia,	15.5,
" of Lime,	7·1,
	226·1.

On supposing the lime to exist as hydrochlorate, and the sulphuric acid in combination with soda, which is the most probable conclusion, then the true composition of sea water will be,

Hydrochlorate of Soda,	159·3 grains,
" of Magnesia,	35·5,
" of Lime,	5·7,
Sulphate of Soda,	25·6,
	226·1.

From the numerous experiments and observations which have been made upon the sea, we learn that the proportions of its saline contents does not differ much in different situations, and that those variations which have been observed, do not, so far as we are acquainted, follow any known rule in this respect. Between South latitude 10° and 20°, the saline contents amount to rather more than 1-24th part; between 18° and 34° north latitude, they are rather less than 1-24th, at the equator nearly 1-25th, and in north latitude 57°, but little more than 1-27th. The water of inland seas, and those bays, &c. that have fresh water rivers emptying into them, contain in general less saline matter. This is the case with the Baltic, and it has been observed that the proportion is increased by a west or north-west wind. During an east wind its specific gravity was found to be 1·0039 and during a north-west wind 1·0098. There are some seas, which differ also in their proportions of the constituents considerably from the Atlantic. The composition of the Dead sea has been given by Dr. Marcet. Its specific gravity is 1·211. One hundred parts contain,

Hydrochlorate of Lime,	3·920,
" of Magnesia,	10·246,
" of Soda,	10·360,
Sulphate of Lime,	0·054.

Many attempts have been made to purify sea water so as to render it portable ; the only effectual method is to distill it and afterwards expose it to the air in shallow vessels. It is used occasionally as a cathartic in doses of about a pint; it has also been recommended in certain stages of scrofulous affections, but as regards its medicinal virtues, it is probably more valuable as a bath than used in any other way. It is from this source that a large portion of the Epsom and Glauber salts used in medicine, and the common salt used for domestic and manufacturing purposes, is derived.

METHOD OF OBTAINING CREAM FROM MILK.

BY GEORGE CARTER, ESQ.

THE process of divesting the milk of its component portion of cream, to an extent hitherto unattainable, has been effected by Mr. Carter, and is thus detailed by that gentleman in a paper presented to the Society of Arts.

A peculiar process of extracting cream from milk, by which a superior richness is produced in the cream, has long been known and practised in Devonshire ; this produce of the dairies of that county being well known to every one by the name of ' clotted,' or ' clouted cream.' As there is no peculiarity in the milk from which this fluid is extracted, it has been frequently a matter of surprise that the process has not been adopted in other parts of the kingdom.

The opportunities, says Mr. Carter, which I possess of making experiments connected with farming, induced me to direct my attention to the produce of the dairy, with a view to increasing the quantity and quality of cream and butter. Having, therefore, made some inquiry into the practice of the Devonshire dairymen, I found, that besides the improved quality of the cream, a larger quantity of butter was produced by this mode. I therefore adopted their system as the ground work of my experiment.

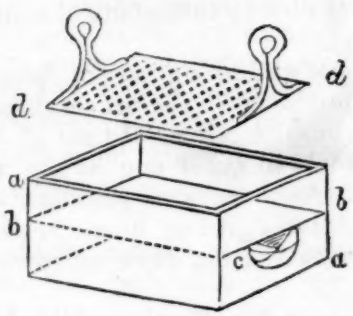
I found, however, that their process is attended with several disadvantages. The mode of applying artificial heat is rude, and the effect uncertain, being entirely dependent on the skill of the dairyman ; the result is also perpetually varied by the weather, and other accidental circumstances, over which he has no control.

My first object, therefore, was to construct my apparatus so that its operations should be (as nearly as possible) invariable, confining myself only to that part of the Devonshire process in which heat is applied to aid the separation of the cream from the milk. After a variety of experiments on the temperature applied, the period of its application, and the form and material for the vessels, I obtained the greatest results by adopting the following process: A four-sided vessel *a a* is formed of zinc plates twelve inches long, eight inches wide, and six inches deep, with a false bottom, *b b*, at one-half the depth.

The only communication with the lower compartment is by the lip *c*, through which it may be filled or emptied.

Having first placed at the bottom of the upper compartment a plate of perforated zinc *d d*, the area of which is equal to that of the false bottom, a gallon (or any given quantity) of milk is poured (immediately when drawn from the cow) into it, and must remain there at rest for twelve hours ; an equal quantity of boiling water must then be poured into the lower compartment through the lip *c*; it is then permitted to stand twelve hours more, (i. e. twenty-four hours altogether,) when the cream will be found

perfect, and of such consistence that the whole may be lifted off by the finger and thumb. It is, however, more effectually removed by gently raising the plate of perforated zinc from the bottom by the ringed handles, by which means the whole of the cream is lifted off in a sheet, without remixing any part of it with the milk below.



With this apparatus I have instituted a series of experiments; and, as a mean of twelve successive ones, I obtained the following results:

Four gallons of milk, treated as above, produced in twenty-four hours, four and a half pints of clotted cream, which, after churning only fifteen minutes, gave forty ounces of butter.

Four gallons of milk, treated in the common mode in earthenware pans, and standing forty-eight hours, produced four pints of cream, which, after churning ninety minutes, gave thirty-six ounces of butter.

The increase in the quantity of cream, therefore, is 12½ per cent., and of butter upwards of 11 per cent.

The advantage, however, is not limited to this increase of quantity, since it appears that in my process ten or fifteen minutes churning is sufficient to produce butter, whilst it requires ninety minutes to produce the same effect with the common cream. The results are also constant; no variety in flavor, color, or consistency, is observable, although my experiments have been made under circumstances which would have affected all these qualities in the common process.

I am not prepared to declare how much of the advantage of this operation depends on mechanical, and how much on chemical action. It has been long known that the application of artificial heat has facilitated the separation of cream from milk, probably by forming an ascending current in the fluid, as well as disengaging the suspended particles of cream by rendering the whole more liquid. But I have found that the material of which I make my vessels is a very important feature in the process; for the cream is formed in zinc vessels many hours earlier than in earthen ones. I hazard a conjecture, that this is owing to a galvanic effect, which is produced by the lactic and acetic acids (developed in the milk by heat and rest) acting slightly on the zinc plates of the vessel.

We have, therefore, two fluids acting on one metal, which is well known to be a galvanic arrangement of the second order. The acids, which would otherwise cause the coagulation of the milk, are thus taken up by the zinc; and the milk by remaining more perfectly fluid admits the easy ascent of the suspended cream. I have ascertained, on analysis, the presence of acetate and lactate of zinc in the skimmed milk, which would, therefore, seem to favor this hypothesis.

I ought to state, that my experiments have been made on land which is not most favorable for the production of butter, it being cold or gravelly; indeed, the whole of the Kentish land is unfit for producing cheese, a certain proof of its inferiority. As, however, my experiments have been comparative, and made with the produce of the same land, so it is reasonable to expect that proportionate advantages will be obtained in all cases, be the land richer or poorer.

I do not claim the merit of originality in this process farther than in the use of the zinc vessel, and the mode in which the heat is applied, by which the results are rendered certain and invariable; neither do I profess to have obtained the maximum of quantity which can be produced by this process. The operation, however, is so simple, and its efficiency so apparent, that it cannot be too generally known.

The experimental farmer will instantly perceive the advantages accruing from its adoption, and probably his attention to the subject may produce greater results. I shall feel richly rewarded, if, by exciting an interest on the subject, I can produce any, the slightest, improvement in the quality or mode of producing an article which may properly be deemed one of the necessaries of life.*—*Trans. Soc. Arts.*

PATENTS FOR MASSACHUSETTS.

Granted in February, 1833.

From the Journal of the Franklin Institute.

For a *Suction Hose for Fire Engines;* James Riley, Boston, Massachusetts, February 6.

After describing the construction of the common suction hose, which is made in pieces of about seven feet in length, and kept distended by copper ferules placed near together, an arrangement allowing of but little elasticity, and requiring much trouble in screwing the parts together, the patentee goes on to describe his improved suction hose, which is thus made:

* It appears from Mr. Carter's statement that milk which has been subjected to his process, is more or less impregnated with the soluble salts of zinc. The well known astringency of these salts, and their emetic quality when in a state of moderate concentration, induced the committee to inquire what use is made of the milk after separation of the cream. Mr. Carter replied that it is employed wholly in feeding pigs, and that the health and growth of these animals do not appear to be at all affected thereby.

A leather hose is formed in the usual way, and over this is wound wire of a suitable size, running spirally from end to end. The wire is to be stitched to the leather, and the whole then covered with a varnish, formed by dissolving gum elastic in spirits of wine : a second tube of leather drawn over this completes the hose. We are told that thus constructed it will be elastic, may be made of any required length, and wound round some part of the engine when not in use.

The objections to the old plan will, in this supposed new mode, be succeeded by others, at least equally formidable. The coiled wire will soon break ; in bending the hose, the wires on one side recede from, and on the opposite side approach each other, and will not resume their proper positions; when bent out of shape, the cylindrical form cannot be restored, and to such bending they are constantly liable. These and other objections caused such hose to be abandoned after a full trial seventeen or eighteen years ago, in the fire engine manufactory of Mr. Jacob Perkins, now Merrick & Agnew's, Philadelphia. How many other abortions this scheme may have undergone we know not; that which we have noticed, was, probably, not the first, and it is likely that the present will not be the last.

Nothwithstanding the utter absence of novelty in the general plan, there is something entirely original in the varnish made by dissolving gum elastic in alcohol; if the patentee has a good recipe for doing this, we hereby bespeak a right to it, either for love or money.

For a *Fireplace* for burning Anthracite Coal ; William M. Russel, Boston, Massachusetts, February 8.

There are about this grate some things which are old and some which are new, but the patentee has not distinguished them from each other. The old parts consist in hollow jambs for heated air, air holes below the fire admitting air from without, and some other minor affairs. The construction of the grate, and the manner of hanging it, however, are, we believe novelties. The ends of the grate are solid plates of cast iron, placed parallel to each other. There are bars both at the front and back, made precisely alike, as either may become the front. There are two moveable bottoms, which are to be used alternately, in a way to be presently described. On the centre of each of the end plates, at the outside, there is a friction wheel, or roller, which also acts as a gudgeon, and on the jambs of the fireplace there are ledges upon which these rollers rest, and upon which they turn, allowing the grate to be drawn forward when required.

When the fire has been completely lighted, a register is opened which admits heated air to pass from the fire place into another room. If there is anything new in the mode of doing this, it is too obscurely described to make it known, and the drawing gives no representation of it, nor do we find any written references to the parts which are represented.

When the fire has gone out, or nearly so, fresh coal may be put into the grate, and charcoal upon it; the spare bottom is then to be placed and attached at top, the grate drawn forward and turned over, when what was the bottom is to be removed. The object of this is to prevent the necessity of raking out the coals to make a new fire. We think that one complaint is thus removed by introducing another which is equally, if not more, troublesome; the pulling out, and turning over, of the grate; the supplying a new bottom, and the getting rid of the old one, are each of them circumstances attended with trouble and inconvenience; all spare parts render such an affair objectionable in domestic economy, as they are not disposed of so easily as spare dollars, or kept in order with the certainty of fixtures.

For the *Application of Lithography to the Printing of Books, Pamphlets, &c.;* Robert Charles Manners, Boston, Massachusetts, February 15.

This invention the patentee denominates TYPOLITHOGRAPHY. The mode of proceeding is to have a copy of the work to be transferred to stone, printed with the kind of ink adapted to that purpose, or with any kind of ink which will answer the intention. The patentee says that he does not claim to be the inventor of copying generally by lithography, 'but to be the inventor of the application of lithography to the purpose of reprinting such printed works as aforesaid.' This 'invention of the application' appears to us rather equivocal, as there is no pretence made to novelty, excepting in applying the transferring to the printing of books. Now every one having any acquaintance with lithography, knows how to make such transfers, both from letter press, and copperplate printing; it has often been spoken of in publications on the subject, and some few months since it was announced in the journals of the day, that a mode of transferring the common ink, even from old books, had been discovered in Europe, by means of which copies of them might be lithographically multiplied with great facility.

For an improved *Stereotype Block;* Enoch Hale, Boston, Massachusetts, February 15.

This resembles so closely the first stereotype block which we recollect to have seen in use, that we really cannot tell the difference between them; they seeming to us to be much like some twins whom we have known, bearing so strong a likeness to each other, that it was necessary to see them together in order to distinguish them from each other. There are the usual two fixed clasps on one side of the block, and two moveable ones on the other; two screws, the heads of which work against the plates of the fixed clasps, pass through the block and into tapped holes in the moveable clasps. The heads of the screws may be formed

into pinions, and turned by a suitable instrument ; or they may be turned in any other convenient mode. 'The invention consists only in the form, and manner of adjusting, the nuts.'

For a *Composition for Drying Oil Paints;* Nathan Hemenway, West Springfield, Hampden county, Massachusetts, February 22.

The composition is formed by taking umber, sugar of lead, white vitriol, and litharge, of each one pound, and adding thereto two pounds of white lead, and half a pound of shellac, red lead, and blue vitriol.

The *acids* of these materials are to be extracted by heat, for which a furnace may be used, having a bottom and sides of brick, and a top of sheet iron. The oils are to be used without boiling.

The foregoing contains all the information given; this, however, is not much to be regretted, as the whole thing is altogether ridiculous. The patentee has certainly made a fine assemblage of dryers, with the exception of the shellac, which in his composition will be something like 'chips in porridge.' About the *acids* that are to be expelled there is some mystery, which the brick furnace, with its iron cover, does not enable us to explain.

For a *Machine for Making Cooper's Rivets;* Timothy Allen, Plymouth, Plymouth county, Massachusetts, February 28.

This is a machine for cutting off the wires, or rods, into proper lengths for a rivet, and impressing the heads upon them by suitable dies. The operation of the machine is not rendered clear by the description and drawing, but it manifestly resembles, in several particulars, other machines for heading rivets and screws ; there possibly may be some novelties of arrangement sufficient to entitle this to the character of a new machine, but, if so, they are not made plain. The claims are to 'the conveyance by the punch, and holding the rod whilst headed by the punch. The solid cast iron die is applied to making rivets by one operation.'

From the New Edinburgh Philosophical Journal.

COMPETITIONS AMONG MECHANICS.

All of the useful arts admit of two distinct kinds of improvement. The one is by new inventions, the other by rendering workmen more expert.

The encouragement of invention has long been a favorite object with the public, and every one also is sensible of the importance of having operative mechanics properly instructed ; yet hardly anything has ever been done towards attaining this last end, however desirable. Indeed, if we except the case of ploughmen, scarcely one class of the members who are employed in providing us with the necessaries of life, has ever had the stimulus of a prize for superior excellence held out to them, though there is not one among them to whom it might not be applied with perfect ease and with incalculable effect.

However varied and complicated a man's employment may be, a very few simple operations will suffice to show his merits. Thus, from the formation of a mortise and tenon, from the construction of a pannelled door, from the fitting of a drawer, the jointing of a leaf of a table, and one or two other such works, a perfect idea may be formed of the qualifications of all the various denominations of square-men, in every stage of their progress. Each of these works might accordingly be assigned to a separate class of competitors, as the test of their advancement; and in every other trade a similar selection might be made, adapted to the various degrees of proficiency of its members. By these means some object of ambition might be placed within the reach of the youngest apprentice, while the most expert workman would not find himself without rivals; and to preserve his pre-eminence, would be compelled to continue his exertions.

The details of such a system must of course be left to practical men; but there are one or two general principles which appear to apply universally, and which, indeed, seem quite necessary to the success of any attempt of the kind. 1. No class should be so large as not to afford a fair chance of success to every individual comprised in it; but that superior merit may obtain a corresponding distinction, the successful competitors in the first class should be brought again in competition with one another for an additional prize, just as in a coursing match. 2. That every one may know with whom he is to contend, the name of each competitor should be entered in a public list, a considerable time before the day of trial. 3. The work by which the merit of each class is to be ascertained, should, as far as possible, be executed in the same place, and at the same time, both to insure that no one shall produce anything but what he has himself executed, and also for the purpose of comparing the different modes of doing the same thing, practised by different workmen. 4. That competitors may have complete assurance of perfect impartiality, they ought, in every case, to have the choice of their own judges. 5. It may be mentioned, in the last place, that books appear by far the best prizes that can be given, both on account of the valuable information which may be thus communicated, and also because a suitable inscription can be put upon them at no expense.

These principles of competition have already been tried with great success by the Glenkens Society, an institution which was formed about two years ago in a retired district of the Stewartry of Kirkenbright, for a similar purpose with that now under consideration; and there can be no doubt that competitions thus conducted, would be still more beneficial under the influence of the condensed population of a large town.

It has long been a general complaint among masters, that they find it next to impossible to fix the attention of their apprentices: that even their journeymen can hardly be prevailed upon to take

an interest in their work beyond what is necessary to provide themselves with bread, and that the idle hours of both are grossly misspent. Indeed, so long as their utmost dexterity and skill can do so little towards raising them into public notice, we can hardly wonder that their work should hang so heavily on their hands; and that their relaxations should be of a kind of which we cannot approve. But were a ladder afforded to a working mechanic by which he might raise himself step by step from his obscurity to such a station as his talents and acquirements enable him to fill with credit to himself and benefit to the public; and were it made plain to him that whatever step he may at present occupy on this ladder, no great exertion would be required to gain one step higher, there cannot be a doubt that the emulation which has by similar means been excited among ploughmen, would be excited in him also, and in a much greater degree. The ordinary occupations of a workshop would become interesting to him as preparations to his public exhibitions; and the time during which he is not thus engaged, would be employed by him in gaining some acquaintance with such branches of science as may be connected with his trade. This unquestionably would be the effect of these competitions on all the ablest men among these classes; and as it is from them that the whole take their tone, their example would be speedily followed. The community at large would become industrious and economical, and men who now sink through all the gradations of idleness and want, till they end in crime, would become active and useful members of society.

This would necessarily produce no inconsiderable diminution in the number of paupers, while it would at the same time tend to lessen the expense of all the necessaries of life. Every hand being improved to the utmost, and employed in the best possible way, would be rendered proportionably more productive, and as the most important inventions have almost all been made by working mechanics, a very rapid addition to them might be confidently anticipated, from the prodigious force of the talent thus brought into operation, which is at present altogether dormant.

To these considerations it must be added, that the proposed competitions would do much towards establishing the connection between the higher and lower classes, which, of late years, has been almost entirely done away, very much to the injury of both. Indeed, however anxious a rich man may now be to make himself useful to his poorer neighbors, he has it not in his power. He comes seldom into contact with any of them, but such as have already reduced themselves to beggary by idleness and dissipation, and, finding that anything he may give them is worse than thrown away, he either abstains from charity altogether, or commits his contributions to some of the benevolent societies with which his country abounds. By them he is sure that his donations will be

judiciously administered; but, when thus made they will do nothing towards securing him a place in the affections of the persons relieved, who, being unacquainted with their benefactor, cannot, of course, make to him any return of gratitude. But were the stamp of merit fixed on the really deserving by these competitions, a class of persons would be offered to the notice of the higher ranks, who would be every way deserving of their countenance. To them it would be given willingly and liberally. It would not fail to produce corresponding feelings of attachment and respect, and the various ranks would thus gradually become bound together by all those sympathies which enhance the joys, and sooth the sorrows of life.

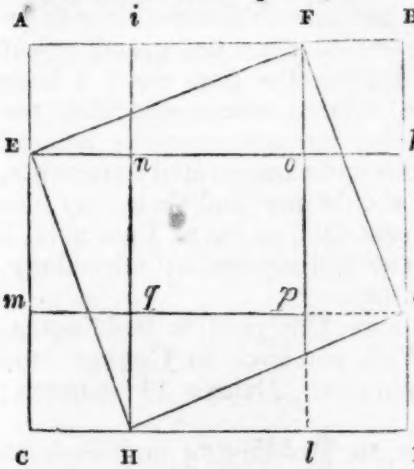
For the Young Mechanic.

NEW DEMONSTRATION OF THE FORTY-SEVENTH PROPOSITION OF EUCLID.

New demonstration of the theorem, 'That the square of the hypothenuse is equal to the sum of the squares of the two legs of a right angled triangle.'

The following method of showing the above fact, seems to me to show the truth more clearly to the eye, on account of the peculiar construction of the figure, than the demonstration usually given in books of Geometry.

Let ABCD be a square; divide the line AB into any two parts at pleasure, as AF FB. Then set off BG, DH and EC = AF. The remaining parts FB, GD, CH and AE will of course be equal. Draw EF, FG, GH, and EH, thus completing the triangles, AFE, FBG, GHD, and ECH, which will be equal and similar; for in AFE, AF is equal to BG, in FBG, and AE is equal to FB, by construction, and the included angle in each triangle is a right angle, being one of the angles of the square, ABCD.



In the same manner as we have shown AEF and FBG to be equal, can we show of any of the four above mentioned. The sides, then, EF, FG, HG and EH, being the hypothenuses of the above triangles, are equal. We then say that the angles EFG, FGH, &c., of the quadrilateral, EFGH are right angles, for, in the triangles AEF and FBG, being similar triangles, AEF opposite AF is

equal to BFG opposite BG. AFE and BGF are for a similar reason equal. Then since AEF and AFE = one right angle, AFE and BFG = one right angle, and since AFE + BFG + EFG = two right angles, it follows that EFG is a right angle.

In the same way can we prove that FGH and GHE are right angles — EFGH, is therefore a square.

Now draw E*k* and *m*G parallel to AB, and *i*H and F*l* parallel to AC, which will divide the square ABCD into the rectangles AEF*o*, FBG*p*, &c., and the squares AE*in*, FO*bk*, *nopq*, &c. The rectangles AEF*o*, F*p*GE, &c., are double the triangles AEF, FBG, &c.

Now AF*mp* is the square of AF, one leg of the triangle AEF, and AE*in*, (equal to *mq*CH, on account of the parallel lines and equal sides of the triangles at each angle of the square ABCD,) is the square of the other leg AE. These two squares contain the rectangles E*n*CH and AEF*o*, plus the square *nopq*.

EFGH is the square of the hypothenuse EF, and this contains the four triangles, EF*o*, E*n*H, GH*q*, and F*p*G, (which are equal to two of the rectangles,) and the square *nopq*. Therefore the squares of the legs are together equal to the square of the hypothenuse, and the triangle not being by construction limited to any proportion of sides, the demonstration is general and complete. B. B.

From the London Mechanics' Magazine.

MR. HANCOCK'S STEAM OMNIBUS.

SIR,—More than six years have elapsed since I began my experiments on steam locomotion; and I have followed it with an ardor that did not admit of any diversion from the grand object which I kept steadily in view. During the past week I have exhibited daily on the Paddington road a steam omnibus, the result of my experience; and having hitherto carefully steered clear both of extravagant anticipations and exaggerated statements, I should be very sorry if any such should now find their way into the public prints. In order to prevent this, as far as I am able, I beg to hand you, for insertion in your wide-spreading miscellany, the following results of the first six days:

April 22.—Started from cottage lane, City road, to Paddington, and from Paddington to London Wall, and back to Cottage lane —9½ to 10 miles—1 hour, 8 minutes. Delays 18 minutes; travelling 50 minutes.

April 23.—From Cottage lane to Paddington and back to Cottage lane—8½ miles—1 hour, 11 minutes. Delays 9 minutes; travelling 62 minutes.

April 24.—Same ground—1 hour 4 minutes. Delays 11 minutes; travelling 53 minutes.

April 25.—Same ground and back as far as St. James' Chapel; piston broke.

April 26.—Same ground and back to Cottage lane—49 minutes. Delays 5 minutes; travelling 44 minutes.

April 27. Same ground—50 minutes. Delays 5½ minutes; travelling 44½ minutes.

Average quantity of coke, one sack to each trip.

It is not intended to run this carriage more than about a week longer; partly because it was only intended as a demonstration of its efficiency, and partly because my own occupation will not admit of my personal attention to the steering, which I have hitherto performed myself, having no other person at present to whose guidance I could with propriety entrust it. During the time that it will require to build two more carriages for the Paddington Company, I shall have one or two others of my own running, which will afford me an opportunity for training steersmen, &c., for this road, which, of all others, I am acquainted with, requires the greatest steadiness and attention.

I am, sir, your obedient servant,

Stratford, May 1, 1833. W. HANCOCK.

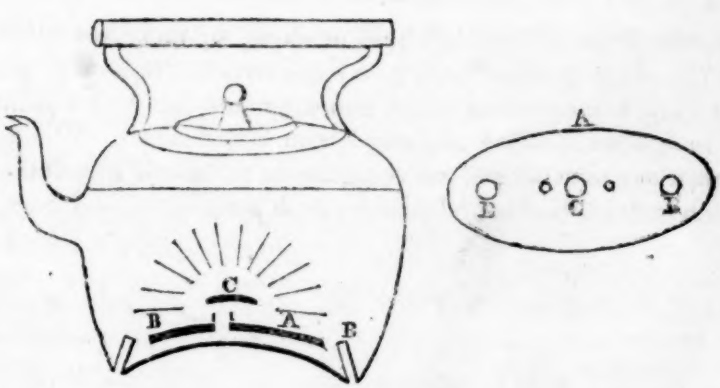
From the London Mechanics' Magazine.

STEAM TEA-KETTLE.

'SIR,—Having found that in all cases steam forcibly introduced into the lower parts of a vessel of water, would heat the water in it quicker than a strong fire, applied externally to the vessel itself, I beg to send you a description of a boiler or kettle of simple construction, which boils in about half the time that otherwise would be required.

I am, Sir, Yours, very obediently,

Wellesbourne, March 8, 1830. W. H. E.'



'A, second concave metal bottom to the boiler. BB, apertures for the admission of the cold water. C, vent for the heated steam.'

Miscellany.

Sheet Iron Roofs.—Sheet iron coverings are now universally made use of on all new buildings in Petersburg, Moscow, &c. In the case of a fire no harm can come to a house from sparks falling on a roof of this description. The sheets of this iron covering measure two feet four inches wide by four feet eight inches long, and weigh twelve and a half pounds avoirdupois per sheet, or one pound five ounces each superficial square foot. When the sheets are on the roof they measure only two feet wide by four feet in length ; this is owing to the overlapping. They are first painted on both sides once, and when fixed on the roof a second coat is given. The common color is red ; but green paint, it is said, will stand twice the time. Small bits or ears are introduced into the laps for nailing the plates on the two inch square lath on which they are secured.

It takes 12½ sheets to cover 100 feet, the weight of which is only 150 lbs.: the cost only 35s, about 3d per foot.—*Repertory of Patent Inventions.*

A new method of preserving Iron work from rust.—This consists in plunging the pieces to be preserved in a mixture of one part concentrated solution of impure soda, (soda of commerce) and three parts of water. Pieces of iron left for three months in this liquid had lost neither weight nor polish, whilst similar pieces, immersed for five days in the simple water, were covered with rust.—*Recueil Industriel.*

QUESTION.

Sonorous Stones.—There is a kind of stone, by no means uncommon, which has the property of ringing on being struck. It is of a granular even texture, homogeneous color, generally purplish and considerably hard; more than middling composed with other stones. I should like to know if any mineralogist can recognise in the above description, any specimen which either his cabinet or manuals contain or describe.

B. B.